What is claimed is:

1 1. A method for determining component flow rates of a multiphase
2 fluid in a conduit, the fluid consisting of at least three known
3 components, the method comprising the steps of:
4 a) measuring at each of two different positions along the
5 conduit at least four mixture quantities;
6 b) providing a speed of sound in each of the components at the
7 measured pressures and temperatures;
8 c) providing a trial value for each of either the component
9 flow rates or the phase fractions;
10 d) using a predetermined model to calculate values for the
11 measured mixture quantities based on the trial values for
12 each of either the component flow rates or the phase
13 fractions;
14 e) using a predetermined error function to determine an error
15 value; and
16 f) using a predetermined optimizing algorithm to determine
17 whether the calculated values are acceptable, and, if they
18 are not, to provide a new trial value for each of either the
19 component flow rates or the phase fractions.

1 2. A method as in claim 1, wherein the error function is the sum
2 of the squares of the difference between the measured and
3 calculated values at each point.

1 3. A method as in claim 1, wherein the four mixture quantities
2 are the sound speed, the flow velocity of the multiphase fluid,
3 the pressure and the temperature.

1 4. A method for determining component flow rates of a multiphase
2 fluid in a conduit, the fluid consisting of at least three known

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components, the method comprising the steps of:

g) measuring at each of two different positions along the conduit at least four mixture quantities;

h) providing a speed of sound in each of the components at the measured pressures and temperatures;

i) providing a trial value for each of either the component flow rates or the phase fractions;

j) using a predetermined model to calculate values for the measured mixture quantities based on the trial values for each of either the component flow rates or the phase fractions;

k) using a predetermined error function to determine an error value; and

l) using a predetermined optimizing algorithm to determine whether the calculated values are acceptable, and, if they are not, to provide a new trial value for each of either the component flow rates or the phase fractions.

5. A method as in claim 1, wherein the error function is the sum of the squares of the difference between the measured and calculated values at each point.

6. A method as in claim 1, wherein the four mixture quantities are the sound speed, the flow velocity of the multiphase fluid, the pressure and the temperature.

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